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MINE MAN-TRIP AND AMBULANCE CARS

BY

M. J. MECHLING AND H. J. SLOMAN

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MINE MAN-TRIP AND AMBULANCE CARS[1]

By M. J. Mechling and H. J. Sloman[2]

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INTRODUCTION

The practicability of providing safer methods of underground transportation for mine workmen and officials has been given much thought in recent years by advocates of safety, health, and efficiency. Numerous fatalities and disabling injuries have resulted from falls of roof, personal contact with both electrical conductors and timbers, and improper position or conduct of passengers while they were in man-trips. Unfavorable atmospheric exposure due to high-velocity air currents and sudden changes in temperature may adversely affect the health of mine workmen if they are transported in unprotected cars.

Recent installations of protected man-trip cars, wherein such cars have been utilized to haul men to and from their stations in the mine, have resulted in a large reduction in exposure to haulage hazards. Where special-built cars have been used the probability of injuries to men during transportation in man-trips has been decreased, and the morale of the employees has been improved. A number of man-trip cars are in service in the coal-mining regions; those described in this circular are typical examples of a few installations.

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2/ Coal-Mine Inspection Branch, Health and Safety Division, Bureau of Mines, Pittsburgh, Pa.

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If mine employees are injured while engaged in their occupations and are transported in unprotected cars, they are exposed to numerous hazards in such transportation, and their injuries may be compounded by further injury or undue exposure during transportation. All injured persons are subject to more or less shock, which may be intensified by radical temperature changes and high-velocity air currents so that various physical complications may result. Every practicable protection should be provided during the transportation of injured persons; therefore, the installation of mine ambulance cars should be given serious consideration by the coal-mining industry. Several coal-mining companies had such cars in service when this report was being prepared; two types are described in this circular.

Mine officials and workmen are manifesting considerable interest in man-trip and ambulance cars. This paper has been prepared for the benefit of persons who desire detailed information on cars now in underground service for man-trips and for transporting injured persons. Obviously, variations in the design of the cars described may be necessary to permit application to local conditions. The height and width of the haulageways, together with the radius of curvature of the track, will be some of the limiting factors that will control the type of car that can be operated successfully in a mine.

ACKNOWLEDGMENT

The cooperation of mining-company officials is gratefully acknowledged for providing drawings and displaying equipment for photographic purposes, thus assisting the authors in preparing this circular.

MINE MAN-TRIP CAR A

Figure 1 is a photograph of mine man-trip car A, which has a seating capacity of 38 passengers. The car is of steel construction, with the exception of its wooden-slat seats. The car body is supported by two car trucks, each of which has four wheels equipped with roller bearings.

The wooden-slat seats are 9 inches above the floor of the car and 39 inches below the center of the car ceiling. The seats parallel the short dimension of the car and are installed in pairs back to back, except those at the curved ends of the car, where the seats conform to the end curvature. Access to the interior of the car is from one side only - the "clearance" side of the entry. The open side of the car is opposite the side of the entry on which power conductors are suspended. Both ends and the side of the car opposite the clearance side of the entry are totally enclosed, making it impossible to enter or leave the car except from the clearance side.

The sides and ends of the car are formed from 10-gage steel sheets. The car ceiling or roof is of arched 1/4-inch steel plate covered on the outer or convex side with 1- by 4-inch wooden boards; it is reinforced with steel ribs supported on posts erected at the ends of each pair of transverse seats.

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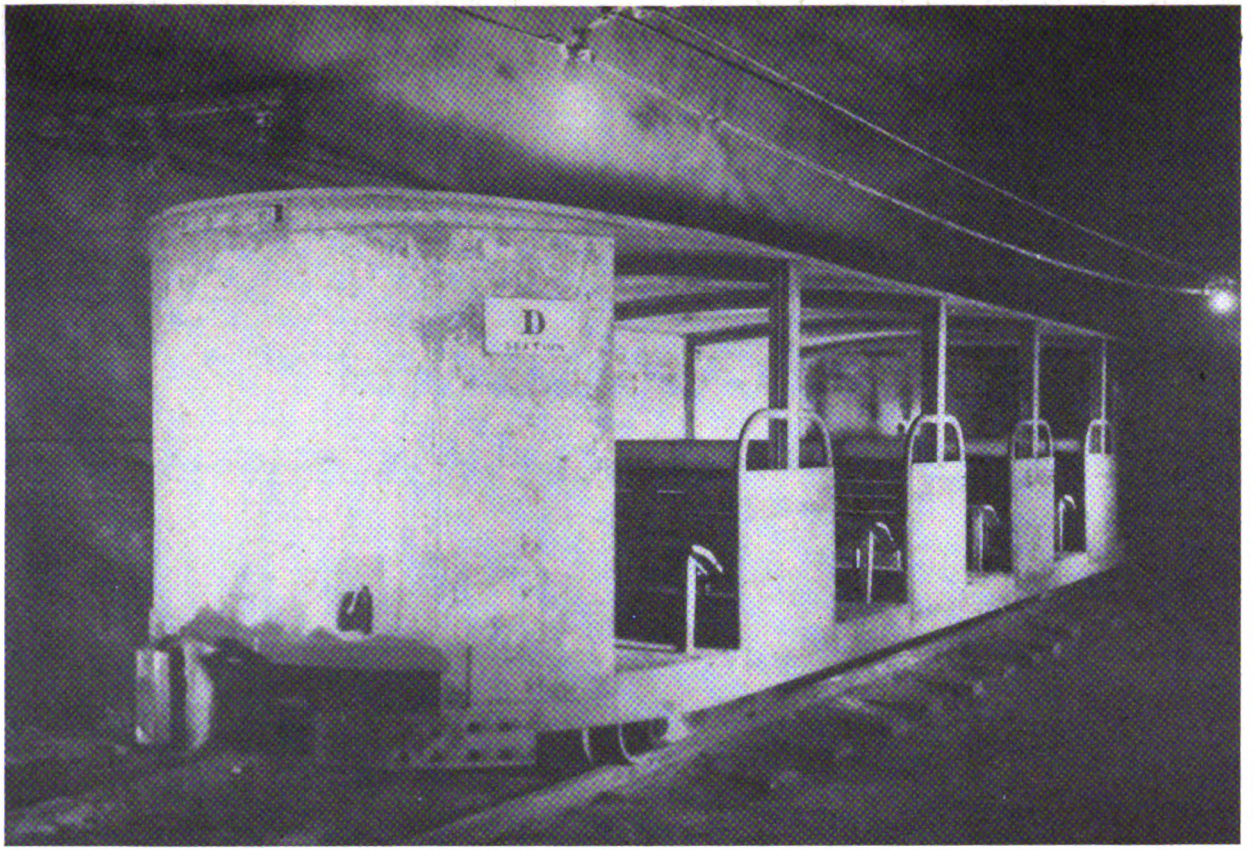

Figure 1. - Mine man-trip car A.

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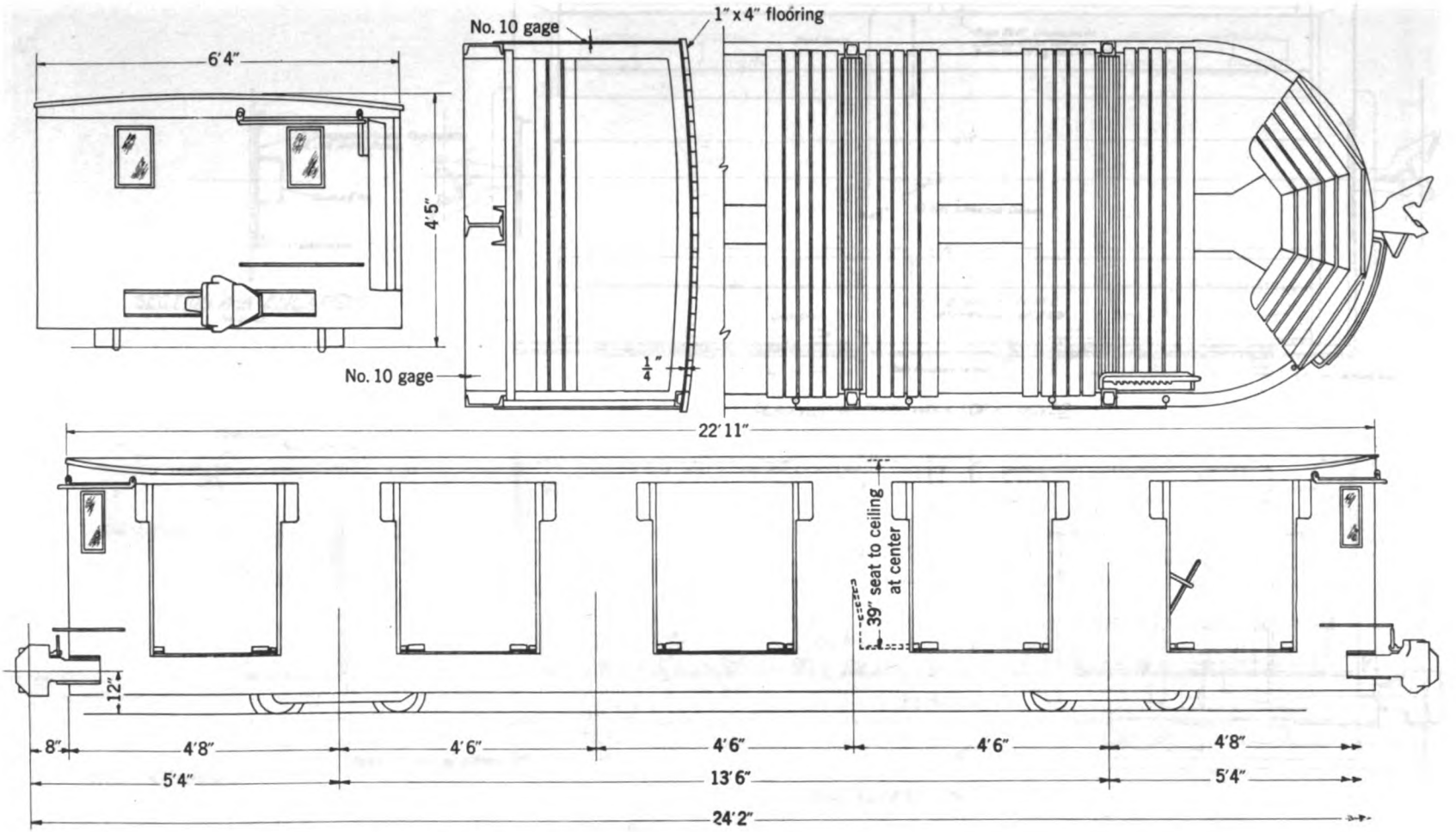

Figure 2. - Thirty-eight passenger man-trip mine-car assembly B.

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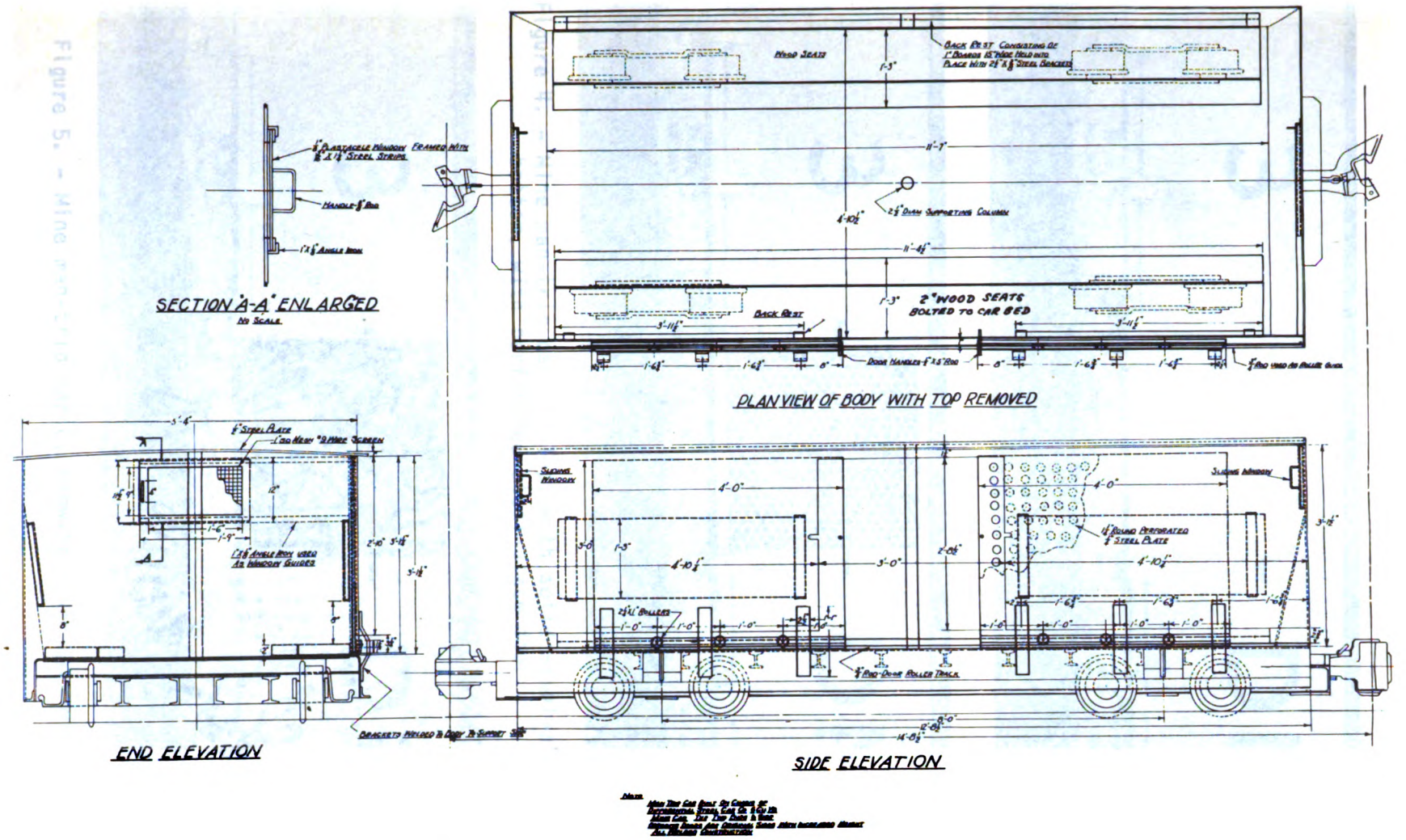

Figure 3. - Man-trip car C.

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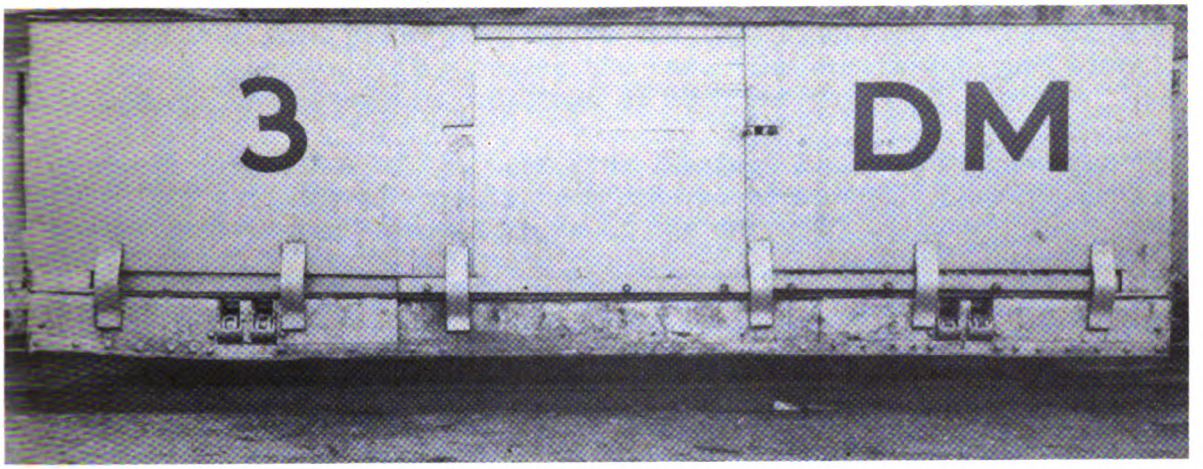

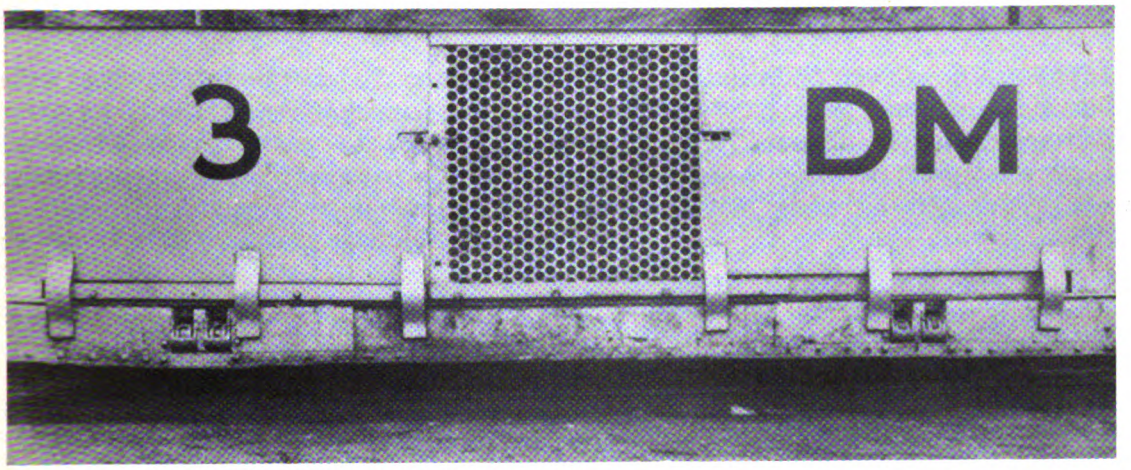

Figure 4. - Mine man-trip car C: Top, with solid steel-plate door; bottom, with perforated steel-plate door.

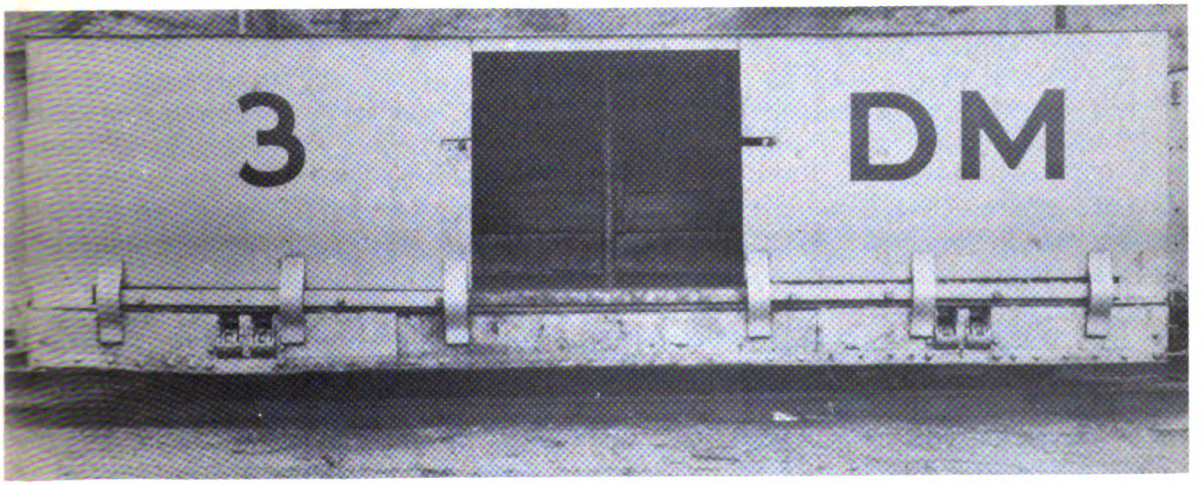

Figure 5. - Mine man-trip car C, showing interior roof support.

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A hand brake is provided at one end of the car; this has a vertical lever which moves in a plane parallel to the long dimension of the car and is operated by a person riding inside the car. The car is equipped with rounded bumpers and automatic couplings at each end.

Over-all dimensions of this car are: 24 feet 2 inches from bumper to bumper, 6 feet 4 inches externally from side to side, and 4 feet 10 inches from top of rail to the external crown of the car roof.

MINE MAN-TRIP CAR B

Mine man-trip car B (figure 2) is virtually of the same design and construction as that shown in figure 1 and also has the same seating capacity. The car shown in figure 2 has had additional vertical posts provided at its center and at each seat to support the roof of the car. The vertical distance from the top of rail to the external crown of the car roof is 4 feet 5 inches.

The extended bumpers of car A have been eliminated in car B to enable the cars to negotiate short-radius curves without locking bumpers and to preclude the possibility of persons riding on the outside of the car, thus eliminating the hazard due to persons being crushed between the cars in the trip. Car B has two windows in each of the rounded ends to improve visibility at the front and rear of the car.

MINE MAN-TRIP CAR C

Figure 3 shows the details of construction of mine man-trip car C. Figure 4 gives two photographs of the car; the top photograph shows the car with a solid steel-plate sliding door, and the bottom view pictures the car with a perforated steel-plate sliding door. The car is of steel construction, except for wooden seats of 2-inch plank bolted to the car floor and back rests of boards 15 inches wide by 1 inch thick held by steel brackets. The seats are installed longitudinally on the car floor to provide maximum headroom in the interior of the car, approximately 3 feet in height. The over-all dimensions of the car are: Length, 14 feet 8-1/2 inches from bumper to bumper; width, 5 feet 4 inches; height of body, 3 feet 1-1/2 inches; and distance from the top of rail to top of car body, 4 feet 7 inches.

The car is entirely enclosed, having a sliding, vertical steel door on the side where men enter and leave the car. A sliding door of solid steel plate 1/4 inch thick, mounted in a frame on steel rollers, is provided for use during cold weather; this door is replaced by a 1/4-inch-thick perforated steel door during mild and warm weather. A screened vent made of No. 9 steel wire with 1-inch-square openings is provided in each end of the car near the ceiling, as shown in the end and side elevation of figure 3 and at the right of each photograph in figure 4. The vents have a full opening 1 foot 6 inches in length by 9 inches in width; however, the opening is adjustable by means of a sliding "plastacele" window that is framed in steel strips and is supported by two horizontal angle-iron guides. The adjustable

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vents permit satisfactory ventilation of the car when men are being transported. The roof of the car is of slightly arched steel plate, 1/2 inch thick. The sides, ends, and floor of the car are of flat steel-plate construction. In addition to the support of the car roof by the end and side plates, a 2-1/2-inch-diameter solid-steel column is erected between the car floor and ceiling to prevent collapse at the roof of the car from falling material. Figure 5 shows the car with the sliding door open, the steel column in the center, and a longitudinal seat on the side opposite the door. The body of this man-trip car was built on a chassis for a 6-cubic-yard-capacity mine car. Twelve persons can be seated comfortably in the car.

MAN-TRIP CABOOSE D

Car D is a man-trip caboose; figure 6 shows part of a man-trip train of cars, with the caboose between a locomotive and a man-trip car. Ordinarily when a man-trip is operated for hauling men, the caboose is the last car of the trip and is primarily for the exclusive use of the brakeman. When a man-trip is stopped, the brakeman can dismount, act as a rear flagman, and board the caboose eliminating interference with or from persons in the man-trip.

Figure 7 shows the construction details of the man-trip caboose. It is built on a chassis of a 6-cubic-yard-capacity mine car, with two trucks each having four car wheels. The caboose body is essentially of steel-plate construction with a slightly arched car roof. Over-all dimensions of the cab are: Length, 4 feet 3 inches; width, 5 feet 1 inch; and height, 3 feet 1 inch. Two longitudinal wooden-plank seats, bolted to the cab floor, are provided, and each has a board back rest so that, if necessary, more than one person can ride in the cab. The approach to each end of the caboose is by means of a platform with protective hand railings of 1-1/4-inch steel pipe. At each end of the cab is a transverse sliding door mounted on a roller frame, constituting the entrance to the cab. A "plastacele" window is in each sliding door to permit front and rear vision when the doors are closed. The design and construction of the man-trip caboose afford maximum safety, comfort, visibility, and convenience to the brakeman who rides in it.

MINE AMBULANCE CAR E

Figure 8 shows two photographic views of mine ambulance car E, which is used to transport injured persons from a mine. The side view of the ambulance car shows a sliding door and a "plastacele" window through which first-aid equipment and an inhalator case are visible. The end view of the car pictures an ambulance cot, splint case and rack, electric light, electric heater, electric switch box, and an adjustable, screened ventilator. Side and end doors permit efficient handling of an injured person and convenient accessibility to equipment. Many provisions for the care and comfort of an injured person are supplied. The length and width of the car permit the administration of artificial respiration, and ample space is allowed for one or more attendants to accompany an injured person. The end view of the car (fig. 8) shows one of the quickly adjustable clamps on the right side by which the standard ambulance cot is prevented from moving during transportation.

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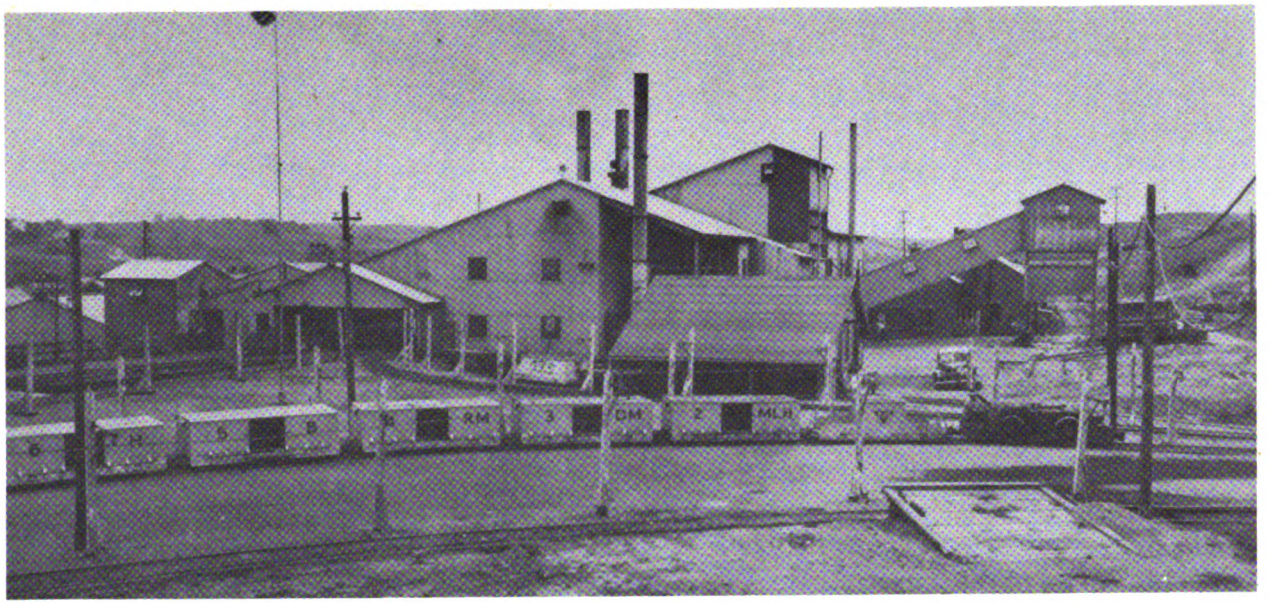

Figure 6. - Mine man-trip cars, showing caboose and locomotive at right.

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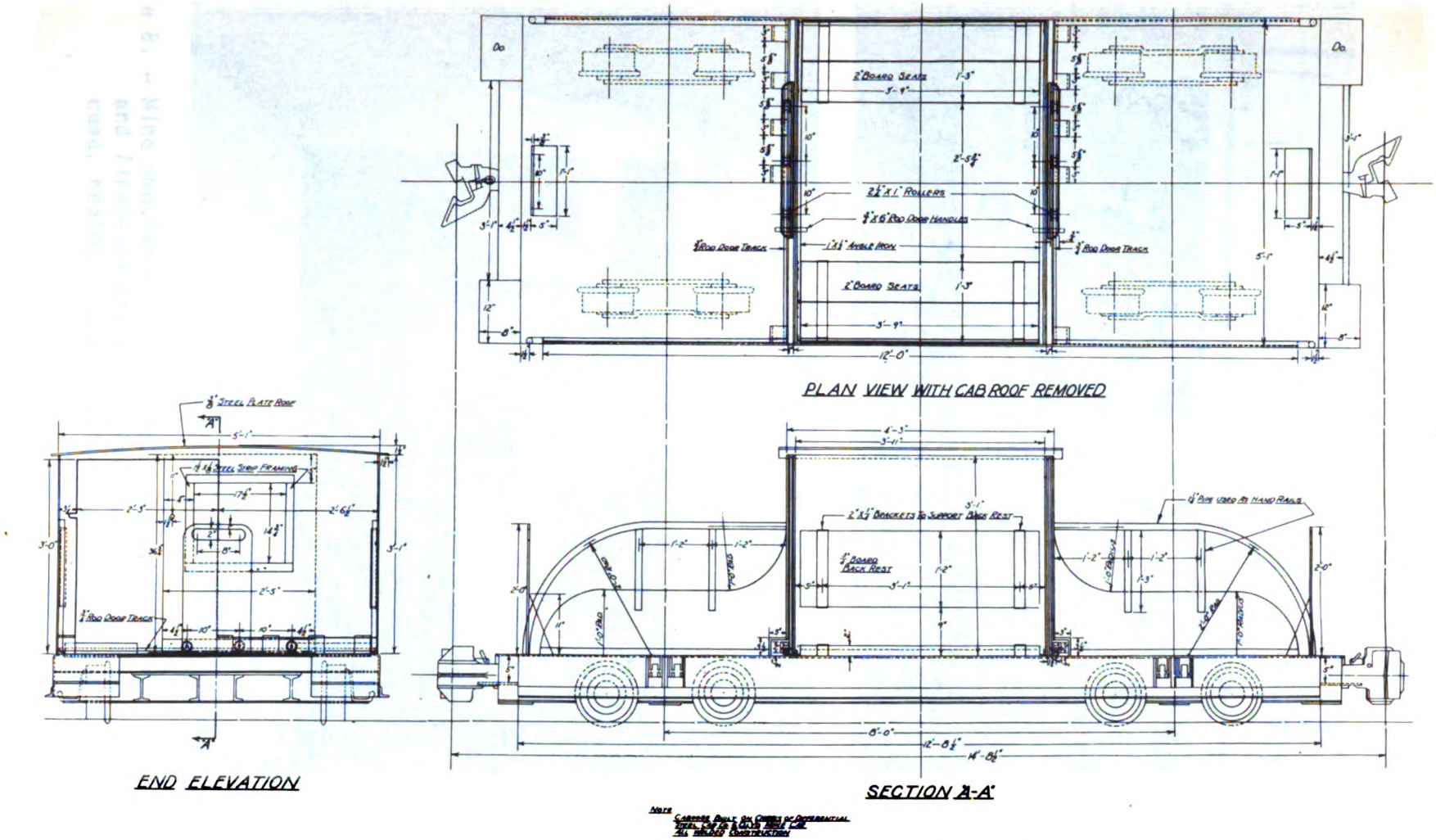
PLAN VIEW WITH CAB ROOF REMOVED
END ELEVATION
SECTION A-A
2" BOARD SEATS
2½" X 1" ROLLERS
¾" X 6" ROD DOOR HANDLES
¾" ROD DOOR TRACK
1" X 1" ANGLE IRON
2" BOARD SEATS
¾" STEEL PLATE ROOF
1¼" X ¼" STEEL STRIP FRAMING
2" X 4" BRACKETS TO SUPPORT BACK REST
4" BOARD BACK REST
1" PIPE USED AS HAND RAILS
12'-0"

Figure 7. - Brakeman's man-trip caboose D.

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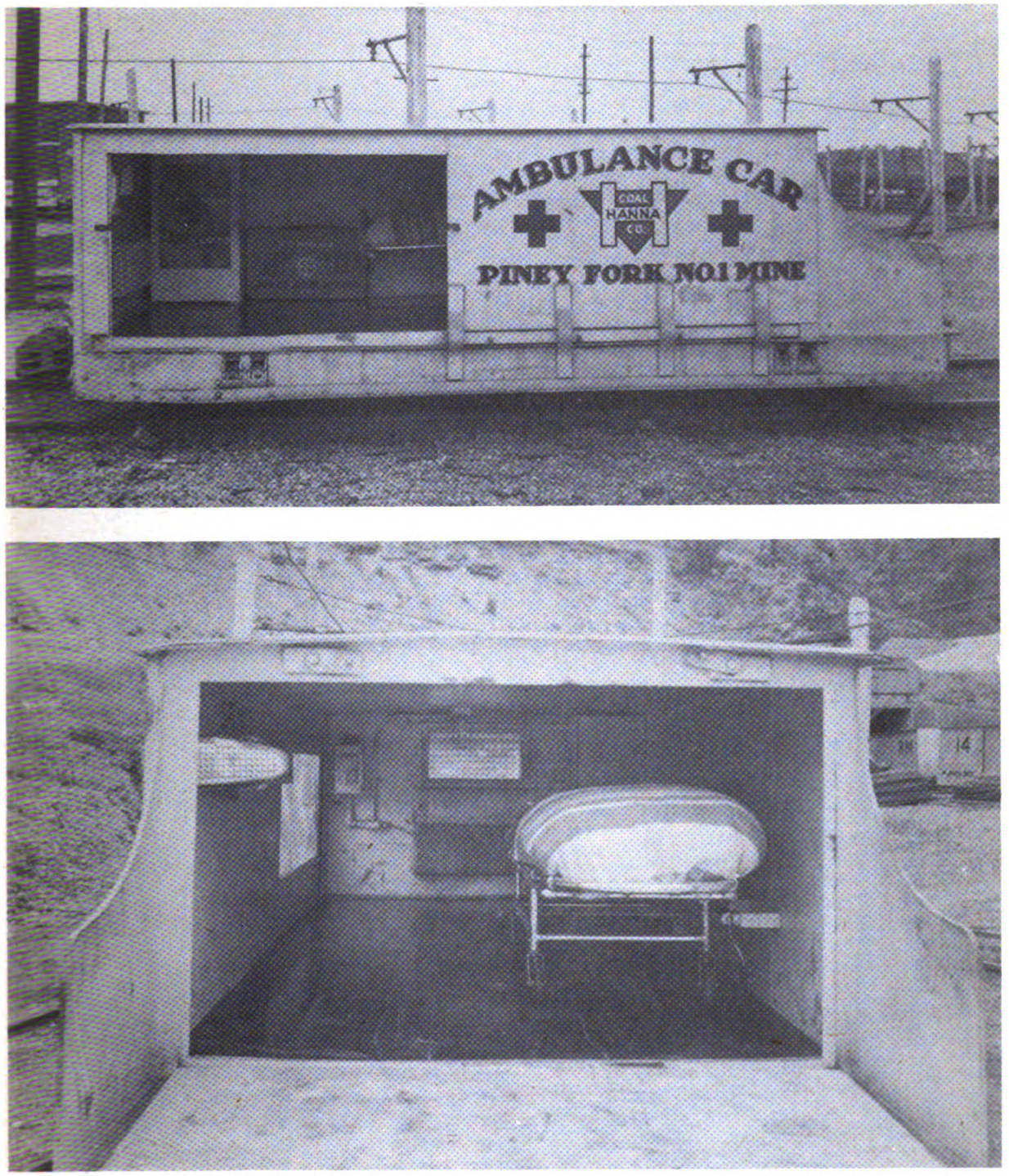

Figure 8. - Mine ambulance car E: Top, "plastacele" side window with inhalator and first-aid equipment visible; bottom, view showing cot, splint case, heater, electric switch, and ventilator.

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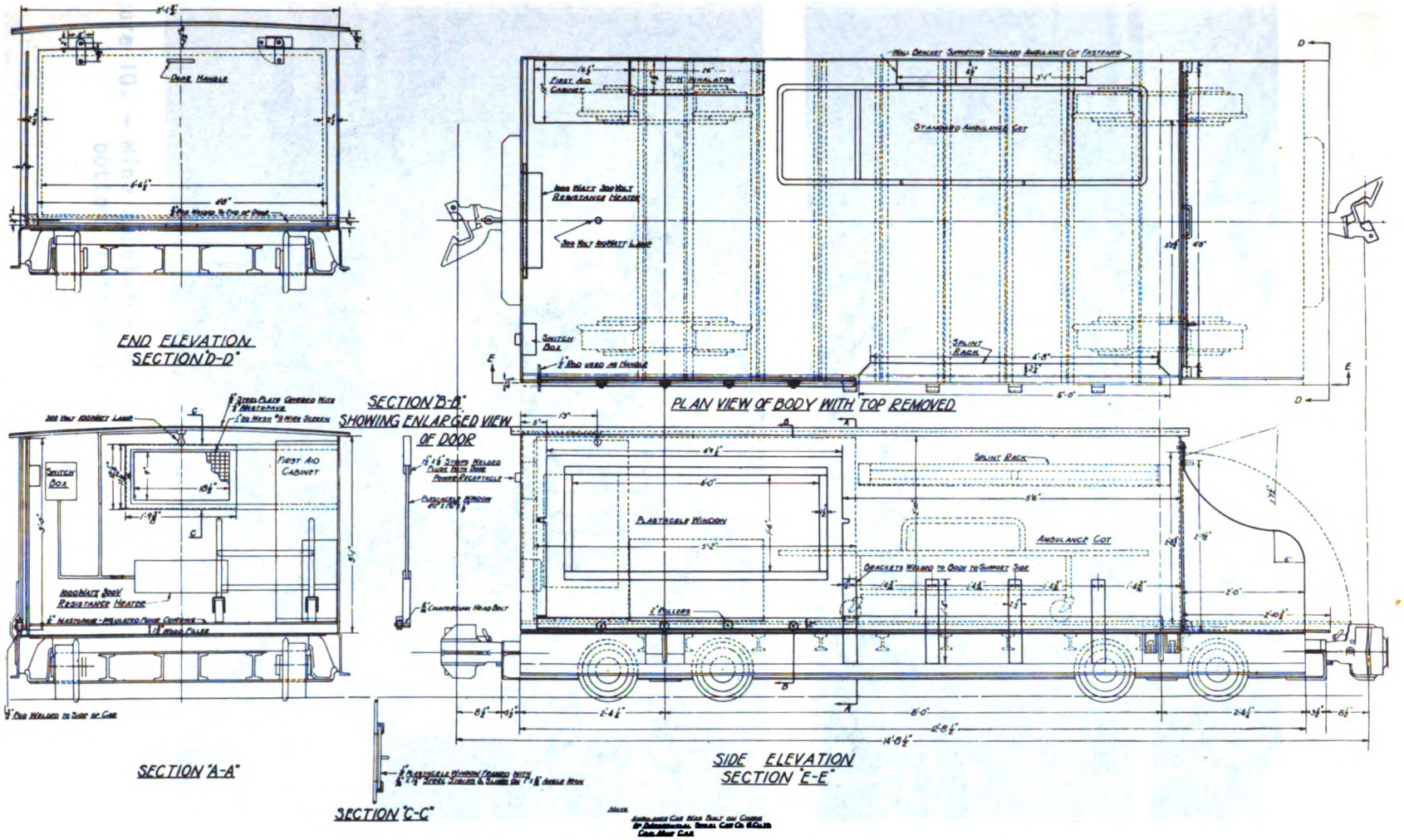

Figure 9. - Plan of track-mounted mine ambulance car E.

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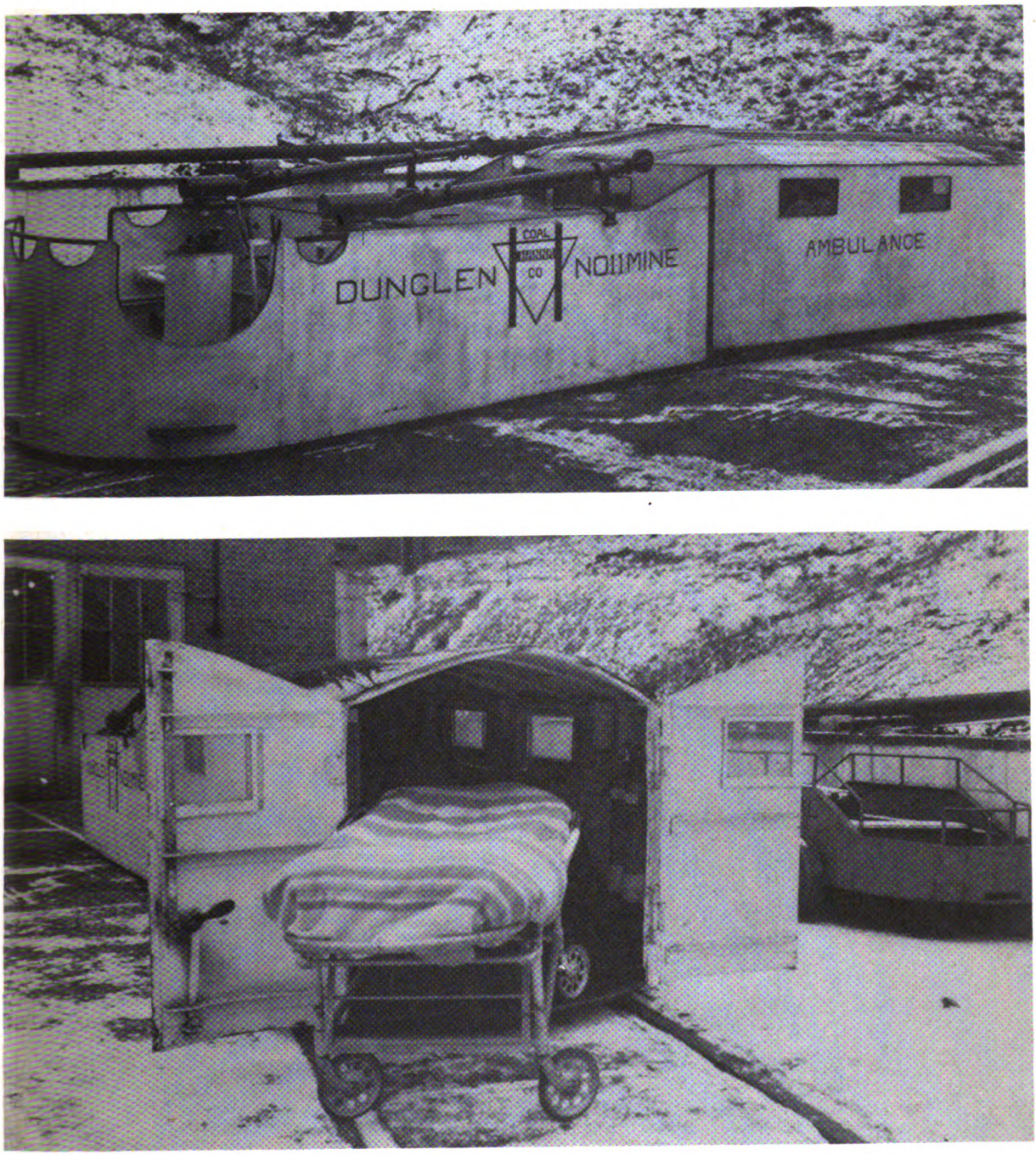

Figure 10. - Mine ambulance car F: Top, car attached to mine locomotive; bottom, removal of cot from end of car.

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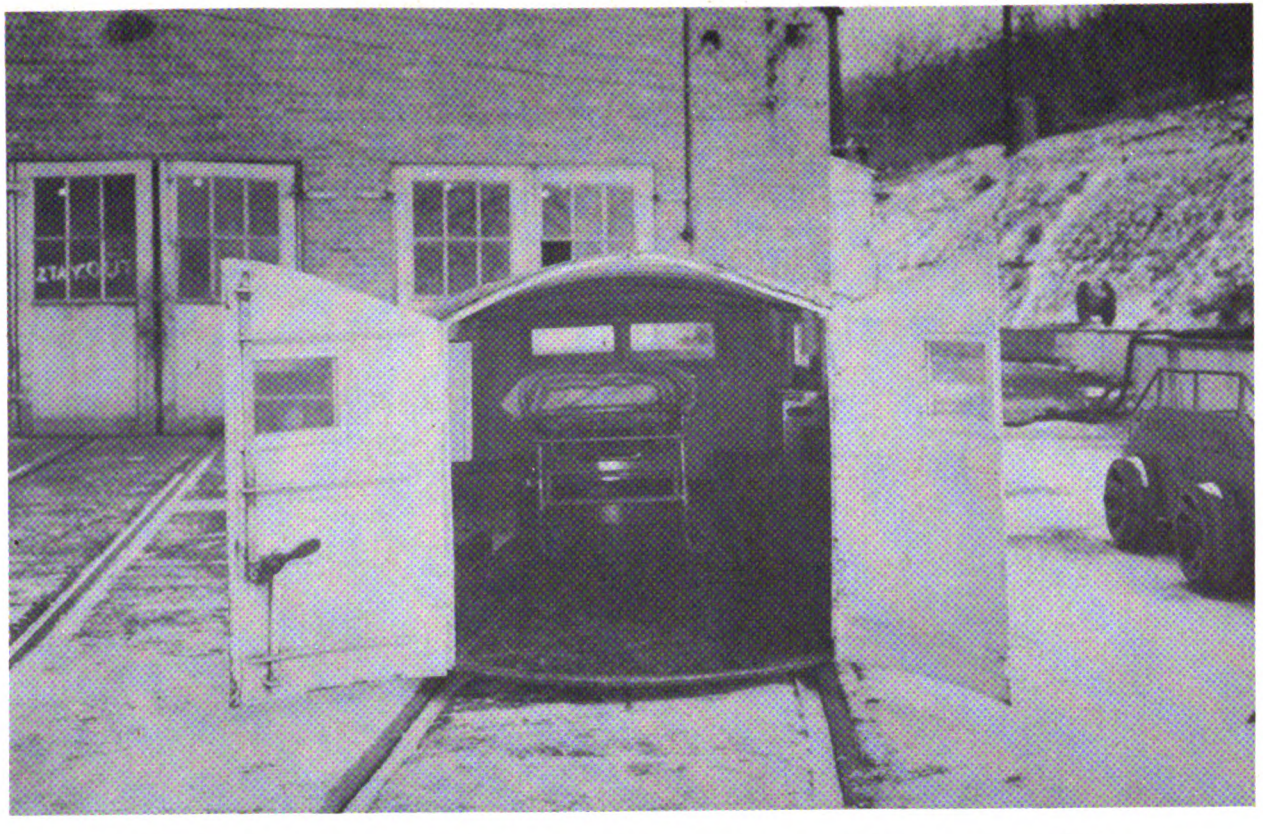

Figure 11. - Mine ambulance car F, showing cot in fixed position.

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Details of construction of mine ambulance car E are shown in figure 9. The steel-plate welded body is built on the chassis of a 6-cubic-yard-capacity mine car. Two car trucks, each with four roller-bearing wheels, are provided. Dimensions of the car body are: Length, 12 feet 8-1/2 inches; width, 5 feet 1-3/4 inches; and height, 3 feet. The steel-plate floor is covered by 1-3/4-inch plank filler, on top of which is a 1/4-inch thickness of insulated floor covering. The roof of the car is 1/2-inch arched-steel plate, also covered with a 1/4-inch thickness of insulation on its exterior. In addition to woolen blankets, the 1,000-watt 300-volt electric heater provides ample warmth for a patient. Adequate illumination is through a 100-watt 300-volt incandescent lamp. The screened ventilator shown in the end view of figure 8 and section "A-A" of figure 9 is covered with a sliding "plastacele" window that permits adjustment for suitable ventilation of the car and comfort of a patient. The rear door is held in a vertical position by clamps when the car is in transit. The door is hinged at the bottom and swings downward to form a gently sloping platform to permit ease of loading or unloading the ambulance cot, as shown in the end view of figure 8.

An injured person can be transferred from the ambulance car to an automobile ambulance on the surface near the mine portal for transportation to a dispensary or hospital without being removed from the cot. This is a most important development because reduction in the number of times an injured person is handled reduces the possibility of aggravating the injury by excessive handling or exposure before delivery to the care of a physician.

The ambulance car is stored on a specially maintained and plainly marked sidetrack inside the mine as near to the active sections as possible. The electric heater is kept connected to the mine electric circuit so that the temperature of the car is always suitable for transportation of the injured. The car can be hauled by any available locomotive.

MINE AMBULANCE CAR F

Figure 10 shows two photographs of mine ambulance car F, which is somewhat similar to mine ambulance car E insofar as material, equipment, and available space are concerned. The uniqueness of design is that the unit embodies the tractor-trailer principle, in which a combination storage-battery and trolley locomotive is the tractor and the ambulance car is the trailer. The running gear of the ambulance car consists of a single axle equipped with two roller-bearing wheels. The riding quality of this car is reported to be superior to that of the ordinary or conventional-type design with two trucks. The unit is streamlined, and the locomotive is maintained as a permanent part of the equipment, obviating the necessity of obtaining a mine locomotive to move the ambulance car when an occasion for use arises. The locomotive operates from the trolley circuit where trolley wires are hung and when power therefrom is available. Storage batteries permit movement of the unit beyond the trolley circuit, such as at or near working faces or on haulageways when the trolley circuit is deenergized. The bottom photograph of figure 10 shows the ambulance cot being removed from the rear of the car. Figure 11 shows the cot fixed in position in the ambulance car to prevent its movement when an injured person is being transported.

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Figure 12 shows the plan and longitudinal views of the ambulance unit. The ambulance car is shown attached to the locomotive by a kingpin suspension similar to other tractor-trailer connections. The ambulance car has clear-vision windows in front and back, and on both sides. Access to the interior is through vertically hung doors that swing outward. Figures 10 and 11 show the interior and equipment of the car in addition to the cot. Ample space is available for one or more attendants to accompany an injured person.

CONCLUSION

Cars that are specially designed and used exclusively for hauling men to and from their stations in a mine are a great improvement over ordinary mine cars that are used primarily for hauling coal. Not only do man-trip cars provide greater riding comfort, but the mine workmen are given greater protection. The greatest hazards in hauling men are due to falls of roof along the haulageways, derailments, and contact with power conductors and roof supports. A man-trip involves the concentration of a fairly large number of men in a small volume of space, even though the occupied space is changed constantly as a man-trip moves. At any instant when a man-trip, consisting of ordinary open mine cars, is being hauled, a fall of roof or a serious derailment may kill or injure a number of men. The overhead protection of the specially designed man-trip cars reduces the possibility of injury to men in transit. Moreover, the health of the men is safeguarded against unfavorable atmospheric exposure.

Injured persons, especially those who have suffered broken backs or fractured limbs or internal injuries, often have been injured more severely by rough or unnecessary handling in getting them out of the mine than by the original injury. The good work of efficient first-aid application is often undone by inefficient handling and transportation of an injured person. It is difficult to handle an injured person on a stretcher in an ordinary mine car and, at the same time, provide for his comfort. The development of the ambulance car, with its cot and other accessories, can do much to fill the needed gap in handling an injured person and provide for his comfort from the place of injury in a mine to the outside before removal to a hospital or delivery to a physician. The overhead protection of an ambulance car reduces the possibility of further injury due to a fall of roof or a derailment. The total enclosure, with adjustable vents and a heater, permits reduction of shock by providing a comfortable atmosphere in the car while an injured person is in transit.

Where man-trip and ambulance cars have been in service, no one has been injured during transportation. The mine employees have expressed themselves as being especially well pleased with the reduction in customary riding discomforts.

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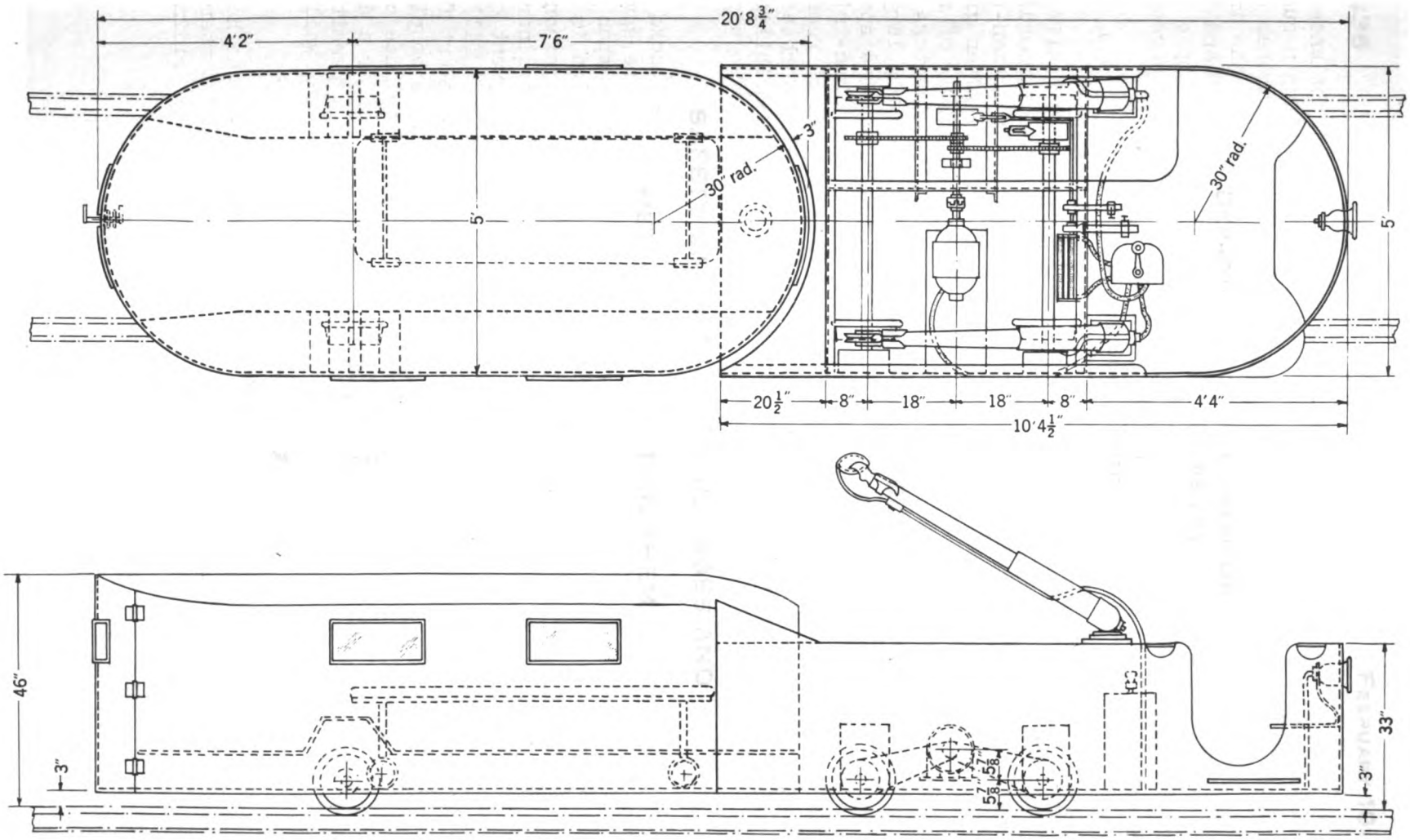

Figure 12. - Ambulance unit F.

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